DOCUMENT RESUME

ED 230 773 CE 036 232

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TITLE Competency Test Items for Applied Principles of Agribusiness and Natural Resources Occupations. Agricultural Mechanics Component. A Report of Research.
INSTITUTION Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
PUB DATE Apr 83
NOTE 43p.; For related documents, see CE 036 227-231.
PUB TYPE Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Agribusiness; *Agricultural Education; *Agricultural Engineering; *Agricultural Machinery; Agricultural Machinery Occupations; Agricultural Occupations; Behavioral Objectives; Competency Based Education; *Criterion Referenced Tests; *Equipment Maintenance; Equipment Utilization; Hand Tools; Multiple Choice Tests; Natural Resources; Safety; Secondary Education; Test Construction; Test Items; Vocational Education; Welding

ABSTRACT

An activity was undertaken to develop written criterion-referenced tests for the agricultural mechanics component of the Applied Principles of Agribusiness and Natural Resources. Intended for tenth grade students who have completed Fundamentals of Agribusiness and Natural Resources Occupations, applied principles were designed to consist of three components, with each component comprising one-third of the school year. The agricultural mechanics component was designed as a specialized component to be taught together with the common core and one other specialized component. A criterion-referenced test was developed for the agricultural mechanics component from a list of competencies that was compiled. Project results were a list of specific competencies for the agricultural mechanics component of Applied Principles of Agribusiness and Natural Resources Occupations and an item bank of multiple choice test items and answer keys for the agricultural mechanics component. Criteria for selecting items from the item bank for testing purposes were recommended. (Two tables display summary statistics and complete item analyses for each question in the item bank. Appendixes, amounting to one-half of the report, contain the list of competencies, test items, and answer keys.) (YLB)

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COMPETENCY TEST ITEMS FOR APPLIED PRINCIPLES OF AGRIBUSINESS AND NATURAL RESOURCES OCCUPATIONS

AGRICULTURAL MECHANICS COMPONENT

A Report of Research

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CE036232

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ACKNOWLEDGEMENTS

The writers wish to express gratitude to the agribusiness and natural resources education teachers, state administrative staff in agricultural education, teacher educators in agricultural education, and county supervisors in agricultural education throughout the state of Florida who participated in development and critique of this instrument. Without their assistance, this study would not have been possible.

Thanks also go to the graduate students who were involved with this study, specifically Glenn Osterhout, Coleen Kaczor, Gail Chesnut, and Teron Jackson. Appreciation is also extended to Lynne Kirkland, Barbara Schatt, and Roxann Mayros for typing this document and to Jane McCoy for the art work.

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Introduction

The Vocational Education Act of 1963 and the Vocational Education Amendments of 1968 provided the foundation upon which the scope of traditional vocational education programs have been broadened and new programs have been initiated. As a result, vocational agriculture/agribusiness has been characterized by accelerated growth, expanded program offerings, and increased emphasis. For example, in 1967-68, Florida had 229 vocational agriculture/agribusiness departments and employed 284 teachers. According to Kirkland (1979), by the 1978-79 school year the number of departments had increased 62 percent (373 departments) and the number of teachers employed had increased by 103 percent (576 teachers). In the 1982-83 school year, there were 409 departments employing 573 vocational agriculture teachers (Department of Agricultural and Extension Education, University of Florida, 1982).

During this same period of time, there has been an increased emphasis regarding the need to develop and improve approaches for evaluating educational programs. Currently, a great deal of attention is being given to the concept of accountability in education. Effective educational evaluation is vital for improving education programs since it provides the basis upon which to determine the merits of existing programs, the need for new programs, and revision of existing programs.

In this atmosphere of accountability, legislators, educators, and the general public are asking if expenditures for vocational education are producing desired results and funding agencies are asking for evaluative information upon which to base policy decisions. Moreover, a review of the Vocational Educational Amendment of 1976 (American Vocational Journal,

1976) makes it clear that the writers of that legislation expect evaluations of vocational education programs to yield data and information useful in formulating on-going and future policy and program decisions. However, from a review of a report to the Governor of Florida, it is obvious that sufficient data regarding the effectiveness of vocational education is not available, thus lending further support for the need to investigate this area (Governor's Commission on Secondary Schools, 1983).

In addition, competency-based education is a development receiving considerable attention in the literature and from professional educators. Florida is currently involved in a major effort to implement competency-based vocational education (Harrington, Johnson, Fagan, Freedman, and Reichman, 1976; Fagan and Huckaby, 1982). Using this instructional model, the curriculum is built around objectives that industry recognizes as necessary for employment. In addition, this model places major emphasis on evaluation of educational programs in terms of pre-specified outcomes, requiring that program outcomes be specified in terms of the behaviors, competencies, and performance capabilities expected of students completing instructional programs. Consequently, one measure of program effectiveness is the extent to which students completing or leaving an instructional program possess or fail to possess the behaviors and competencies specified in the instructional objectives. In instructional systems of this nature, test information is not only used to evaluate program effectiveness, but can also be used to evaluate the student's mastery of instructional objectives as an aid to placing students in appropriate employment or in additional instructional situations (Glasser and Nitko, 1971). Instruments or tests designed especially for this purpose are known as criterion-referenced tests (Hambleton and Novick, 1972).

Criterion-referenced tests are defined as tests made up of items keyed to a set of specific behavioral objectives (Ivens, 1970). Others have defined a criterion-referenced test as one that is deliberately constructed so as to yield measurements that are directly interpretable in terms of specified performance standards (Glasser and Nitko, 1971).

Criterion-referenced instruments have not been developed so that program effectiveness and student achievement can be assessed in most areas of agribusiness and natural resources. This activity was designed to develop criterion-referenced tests for the agricultural mechanics component of Applied Principles of Agribusiness and Natural Resources Occupations.

Applied Principles of Agribusiness and Natural Resources Occupations (3720) is primarily designed to be taught at the tenth grade level and students who enroll should have completed Fundamentals of Agribusiness and Natural Resources Occupations (3710) in the ninth grade. Applied Principles consists of three components with each component designed to utilize one-third of the school year (60 days). All students complete the common core component consisting of competencies common to all agricultural/agribusiness occupations. The common core competencies are divided into three instructional areas: agricultural business management; agricultural mechanics; and leadership and citizenship development. Instructors then select two specialized components to complete the Applied Principles course from the following taxonomies: agricultural mechanics; agricultural production; agricultural products; agricultural resources; agricultural supplies and services; forestry; and ornamental horticulture. Each of these components are taught for one-third of the school year (60 days) and these two

components should be selected so as to provide the basic competencies for specialized programs offered at the eleventh and twelfth grade. More detailed descriptive information and specific planning data are available in the publication A Suggested Curriculum Guide for Applied Principles of Agribusiness and Natural Resources Occupations (Panhandle Area Educational Cooperative and Florida Department of Education, 1980).

Purpose

The central purpose of this study was to develop and field test written criterion-referenced tests for the agricultural mechanics component of Applied Principles of Agribusiness and Natural Resources Occupations. In order to achieve this purpose, the following objectives were developed as guidelines for conducting the research:

1. Develop and compile a list of competencies for the agricultural mechanics component of Applied Principles of Agribusiness and Natural Resources Occupations.

2. Develop a criterion referenced test for the agricultural mechanics component of Applied Principles of Agribusiness and Natural Resources Occupations.

3. Field test the instrument in order to determine instrument validity and reliability, and to determine item difficulty, item discrimination, and point biserial correlation for each test item.

Procedure

Objective 1

Based upon the objectives identified in the Applied Principles of Agricultural Occupations Curriculum Guide (Curriculum Materials Center, 1978), a list of competencies was generated and compiled. This list was reviewed and modified by a group of teachers, Florida Department of Education regional consultants for agribusiness, and University of Florida faculty members at a Curriculum Development Workshop held in August, 1980 (Panhandle Area Educational Cooperative and Florida Department of Education, 1980). The competency statements reported in this document have undergone minor refinements in wording since their original publication in 1980. These competencies represent the performance standards relating to Applied Principles that students should master prior to entering specialized programs of agribusiness and natural resources education.

Objective 2

Using the competency statements derived in Objective 1, test items were developed for each competency statement. A consultant staff of teachers, regional consultants, and University faculty members was asked to review and revise the items developed. The consultant staff was specifically asked to accomplish the following tasks:

1. To review and revise individual test items.

2. To make certain that the items were technically accurate.

3. To verify that the item did assess the competency it was purported to address.

As a result of this activity, minor changes were made in the test.

Objective 3

The instrument was field tested by administering it to groups of students who had completed Applied Principles of Agribusiness and Natural Resources Ocupations. The data from the field tests were analyzed for item difficulty, item discrimination, and point biserial correlation. A Kuder-Richardson 20 Correlation was calculated as the measure for test reliability.

Results

The major results of this project were: a list of specific competencies for the agricultural mechanics component of Applied Principles of Agribusiness and Natural Resources Occupations (see Appendix A) and an item bank of multiple choice test items and an answer key for the agricultural mechanics component (see Appendix B).

Summary statistics relative to the agricultural mechanics component of Applied Principles are presented in Table 1. The estimate of reliability of the test by the Kuder-Richardson 20 correlation coefficient was .77.

TABLE 1
Summary Statistical Data Relative to the
Agricultural Mechanics Component of
Applied Principles of Agribusiness
and Natural Resources Occupations

Instructional Area	Factor	Statistic
Agricultural Mechanics	Number of Students Taking Test	30.00
	Total Number of Items on Exam	86.00
	Highest Possible Score	86.00
	High Score	50.00
	Low Score	16.00
	Mean Score	30.53
	Median Score	31.50
	Mode Score	35.00
	Standard Deviation	8.59
	Standard Error of Measurement	4.12
	Kuder-Richardson 20 Correlation	0.77

A complete item analysis for each question in the item bank relative to agricultural mechanics is displayed in Table 2. It may be observed that three statistics are presented: item difficulty; item discrimination; and item point biserial coefficient. Item difficulty (index of difficulty) is defined as the proportion of students who correctly answer an item. The average difficulty of a test is the average of the individual item difficulties. For maximum discrimination among students, an average difficulty of .60 is ideal.

Item discrimination (index of discrimination) is a numerical indicator of how the poorer students answered the item as compared to how the better students answered the item. The scores are divided into three groups with the top 27 percent of the scores in the upper group and the bottom 27 percent in the lower group. The number of correct responses for an item by the lower group is subtrated from the number of correct responses for the item in the upper group. The difference in the number correct is divided by the number of students in either group. The process is repeated for each item.

The point-biserial correlation coefficient is computed for the relationship between a variable for which there are only two categories of scores and a variable for which the scores exist on a continuous distribution. Thus, it is a correlation coefficient indicating the relative degree of relationship between how a student responds to an item and the student's total score on the test.

TABLE 2

Item Analysis of the Item Bank of Questions for the Agricultural Mechanics Component of Applied Principles of Agribusiness and Natural Resources Education

Item Bank Number	Item Difficulty	Item Discrimination	Item Point Biserial Correlation
1	0.60	0.75	0.56
2	0.63	0.75	0.65
3	0.57	0.75	0.52
4	0.33	0.25	0.20
5	0.50	0.00	0.05
6	0.40	0.13	0.13
7	0.27	-0.25	-0.15
8	0.63	0.75	0.51
9	0.43	0.50	0.31
10	0.10	0.00	-0.02
11	0.40	0.25	0.34
12	0.17	-0.38	-0.27
13	0.47	0.13	0.18
14	0.30	0.50	0.39
15	0.40	0.25	0.27
16	0.33	-0.13	-0.14
17	0.40	0.38	0.35
18	0.43	0.38	0.38
19	0.43	0.25	0.20
20	0.10	-0.38	-0.43
21	0.50	0.75	0.57
22	0.57	-0.13	-0.00
23	0.33	0.38	0.35
24	0.13	0.13	0.33
25	0.33	0.38	0.30
26	0.23	0.00	-0.10
27	0.60	0.63	0.52
28	0.23	0.13	0.18
29	0.23	-0.13	-0.09
30	0.37	0.25	0.26

Table 2 (continued)

Item Bank Number	Item Difficulty	Item Discrimination	Item Point Biserial Correlation
31	0.70	0.50	0.39
32	0.63	-0.13	-0.07
33	0.13	0.13	0.18
34	0.17	-0.13	-0.14
35	0.33	0.25	0.30
36	0.00	0.00	0.00
37	0.37	0.50	0.32
38	0.10	0.00	0.03
39	0.30	0.00	0.03
40	0.37	0.00	0.03
41	0.17	0.25	0.23
42	0.33	0.38	0.35
43	0.43	0.25	0.17
44	0.37	-0.13	0.07
45	0.37	-0.13	-0.14
46	0.33	0.25	0.18
47	0.30	0.00	0.03
48	0.30	0.50	0.33
49	0.23	0.00	-0.03
50	0.63	0.00	0.14
51	0.53	0.25	0.17
52	0.13	-0.13	-0.21
53	0.20	-0.25	-0.21
54	0.07	0.00	0.06
55	0.20	0.13	-0.01
56	0.37	0.25	0.32
57	0.20	0.25	-0.01
58	0.43	0.50	0.29
59	0.23	-0.13	-0.05
60	0.20	0.25	0.17
61	0.47	0.63	0.50
62	0.43	0.63	0.38
63	0.63	0.13	0.10
64	0.43	0.50	0.48
65	0.47	0.63	0.56

TABLE 2 (continued)

Item Bank Number	Item Difficulty	Item Discrimination	Item Point Biserial Correlation
66	0.50	0.50	0.26
67	0.27	0.38	0.29
68	0.53	0.38	0.62
69	0.30	0.63	0.37
70	0.63	0.88	0.64
71	0.60	0.88	0.60
72	0.43	0.00	-0.03
73	0.17	0.00	0.12
74	0.23	0.25	0.29
75	0.23	0.50	0.46
76	0.33	0.38	0.31
77	0.20	0.25	0.09
78	0.37	0.13	0.19
79	0.37	0.25	0.36
80	0.20	-0.13	-0.24
81	0.40	0.38	0.19
82	0.33	0.38	0.30
83	0.37	0.25	0.27
84	0.40	0.00	0.16
85	0.23	0.00	0.03
86	0.23	0.00	0.03

It is recommended that the following criteria be used for selecting items from the item banks for testing purposes:

1. Select items that pertain to the instructional objectives which specify the outcomes sought in the instructional program.

2. Select items that have a positive item discrimination index and a positive point biserial correlation coefficient.

3. Select items that were answered correctly by a substantial percentage of the students as indicated by the item difficulty score.

4. Select items that have high point biserial correlation coefficients thus indicating a relatively high relationship between how a student responds to the item and the student's total score on the test.

Recommendations

Based upon the results obtained from this activity, the following recommendations were made:

1. The student assessment test can be used by teachers who are interested in determining how well their students are achieving the competencies that are prescribed for the Applied Principles curriculum. These data should provide a reliable method of determining which instructional areas need further development or improvement.

2. It is recommended that the criteria, specified in the results section of this document, be used to select items for testing purposes.

3. Research be initiated to assess program effectiveness and student achievement in Applied Principles using a sample of the programs in Florida.

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APPENDIX A

Competencies for the Agricultural Mechanics Component
of Applied Principles of Agribusiness and
Natural Resources Occupations

COMPETENCIES FOR THE AGRICULTURAL MECHANICS COMPONENT OF APPLIED PRINCIPLES OF AGRIBUSINESS AND NATURAL RESOURCES OCCUPATIONS

1. The student will demonstrate the ability to properly set up, start, and stop power tools selected in the shop.

2. The student will demonstrate the ability to sharpen, oil, tighten, replace handles, etc., on hand tools as needed.

3. The student will demonstrate safety procedures on selected equipment and hand tools in the shop.

4. The student will select a project from a selected list and be able to sketch the project and figure the bill of materials.

5. The student will construct a project from a selected list using tools and equipment.

6. The student will demonstrate the ability to wire a 3-way switch using selected hand tools.

7. The student will demonstrate the ability to mix concrete according to prescribed standards.

8. The student will cut, thread and ream a pipe.

9. The student will demonstrate the proper settings for the electric welder, demonstrate the ability to select the proper welding rod for welding a selected project, and demonstrrate the ability to weld in flat, vertical, and overhead positions according to prescribed standards.

10. The student will demonstrate the proper technique in brazing, cutting, and bending selected metal stock or plate using an oxyacetylene welding system according to prescribed standards.

11. The student will perform inspections on tractors at recommended time intervals.

12. The student will service ignition and electrical systems on tractors according to the service manuals.

13. The student will trouble shoot selected problems on a tractor.

14. The student will demonstrate the ability to attach selected equipment to power units (Tractor PTO).

15. The student will assemble and adjust planting equipment according to planting conditions on lab plot.

16. The student will assemble and adjust selected tillage equipment according to tillage conditions on lab plot.

17. The student will determine maintenance problems and make minor repairs to buildings and equipment.

APPENDIX B

Item Bank of Multiple Choice Test Items and Answer Key for the Agricultural Mechanics Component of Applied Principles of Agribusiness and Natural Resources Occupations

Test Items for the Agricultural Mechanics
Component of Applied Principles of
Agribusiness and Natural
Resources Occupations

Competency:

The student will demonstrate the ability to properly set up, start, and stop power tools selected in the shop.

1. The rip fence of the table saw can be checked for correct adjustment by measuring the distance from the:

   a. Front and back of the saw blade to the rip fence
   b. Front and back of the saw blade to the left miter groove
   c. Saw blade to the rip fence
   d. Rip fence to the right table top edge

2. When crosscutting, the correct adjustment of the miter gauge can be checked by:

   a. Measuring the distance to the rip fence
   b. A square
   c. The side of a planed board
   d. Both B and C

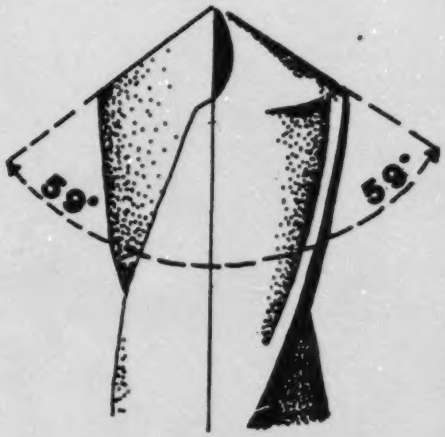
3. How much higher should the blade be above the stock when the table saw blade is adjusted correctly?

   a. 3/8 - 7/16"
   b. 5/16 - 3/8"
   c. 1/4 - 5/16"
   d. 1/8 - 1/4"

4. The picture on the right is what type of drill chuck?

   a. Keyless, self-tightened
   b. Hand-tightened
   c. Geared key (Jacobs-type)
   d. Hex key

5. What is the name and function of the drill bit pictured at the right?



a. Auger bit for drilling brass
b. Twist drill bit for drilling mild steel
c. Expansive bit for drilling wood
d. Fastener bit for drilling mild steel

6. When properly adjusted the tool rest of a grinder should be what distance from the grinding wheel?

a. 1/4"
b. 3/16"
c. 1/8"
d. 1/16"

7. When properly adjusted the tool rest of a grinder should be where in relation to the center of the grinding wheel?

a. Not below the center of the wheel
b. 1/8" below
c. 1/2" below
d. 1" below

8. When drilling most metals, which of the following materials should be used for lubrication?

a. Grease
b. Graphite
c. A light weight oil
d. A heavy weight oil

Competency:

The student will demonstrate the ability to sharpen, oil, tighten, replace handles, etc., on hand tools as needed.

9. What is the name of the tool used to remove the glaze and/or true the surface of a grinding wheel?

   a. Dressing tool
   b. Grinder plane
   c. Grinder wheel file
   d. Grinder wheel rasp

10. What is the position of the tool rest when removing the glaze and/or truing the surface of the grinding wheel?

   a. 1/2" below center and within 1/2" of the wheel
   b. 1/4" below center and within 1/4" of the wheel
   c. 1/4" above center and within 1/4" of the wheel
   d. Flat and within 1/8" of the wheel

11. Which of the following should NOT be used when cleaning dirty, greasy, and/or rusty tools?

   a. Gasoline
   b. Wire brush
   c. Fine emery cloth
   d. Kerosene

12. Which of the following is the first step in redressing a badly nicked chisel?

   a. Grind along flat edge
   b. Grind at right angle on cutting edge
   c. Grind along bevel edge
   d. None of the above

13. The sharpening of a plane blade is the same as sharpening a chisel except that:

   a. The bevel is much longer
   b. Bevels are ground on both sides
   c. The blade corners are slightly rounded
   d. The bevel is hollow ground

14. What is the proper angle shown at right for a cold chisel for general work?

   a. 110°
   b. 80°
   c. 65°
   d. 30°

15. When replacing handles, which of the following material(s) is (are) used to show high spots in the handle when tried in the tool?

    a. Water and die
    b. Starch or chalk
    c. Ink
    d. Graphite

16. After the handle is wedged into place this portion of the handle should be treated with:

    a. Motor oil
    b. Cotton seed oil
    c. Boiled linseed oil
    d. Warmed soy bean oil

17. When using a table vise to replace handles in hand tools, which of the following practices should be followed?

    a. Vise should be tightened as much as possible
    b. Handle should be soaked in water first
    c. Handle should be coated with warm soy bean oil
    d. Vise jaws should be covered with sheet metal

Competency:

The student will demonstrate safety procedures on selected equipment and hand tools in the shop.

18. The first step before drilling, cutting, or sawing used stock is to:

    a. Secure stock
    b. Check for nails, tacks, etc.
    c. Make proper adjustments
    d. Remove guards

19. To prevent the breaking of drill bits while drilling hard materials always drill:

    a. In the vertical position
    b. Pilot holes
    c. In the horizontal position
    d. With 2 twist drill bit

20. Which of the following is NOT an acceptable grounding procedure?

a. The center screw on the recepticle plate
b. Conduit, if it is properly grounded
c. Underground water pipe
d. None of the above

21. When ripping with the table saw the stock should always be pushed with:

a. Table sticks
b. Router sticks
c. Miter sticks
d. Push sticks

22. Before plugging in any power tool, always:

a. Roll up sleeves
b. Put on goggles
c. Check on/off switch
d. Face the equipment

Competency:

The student will select a project from a selected list and be able to sketch the project and figure the bill of materials.

23. What is the inch to foot ratio when a project is drawn to 1/4 scale?

a. 4 inches on diagram equals 1 foot on project
b. 4 inches on diagram equals 4 feet on project
c. 1 inch on diagram equals 4 feet on project
d. .25 inches on diagram equals 4 feet on project

24. What is the running feet of a board 1" X 4" X 14'?

a. 28 feet
b. 14 feet
c. 7 feet
d. 4.6 feet

25. How many board feet are in a 1" X 12" X 24" board?

a. 1 board foot
b. 2 board feet
c. 4 board feet
d. 12 board feet

26. How many <u>total board feet</u> are there in the following bill of materials for a picnic table?

2 ---- 2" X 8" X 12'
3 ---- 2" X 4" X 12'
8 ---- 2" X 6" X 12'

a. 36 board feet
b. 76 board feet
c. 152 board feet
d. 188 board feet

<u>Competency</u>:

The student will construct a project from a selected list using tools and equipment.

27. Which one of the following is <u>NOT</u> a metal marking instrument?

a. Hardy
b. Layout fluid
c. Soap stone
d. Awl

28. Which of the following <u>cold chisels</u> are correct for cutting up to 3/16" flat metal in the vise?

a. Cape chisel
b. Diamond point chisel
c. Half round nose chisel
d. Flat chisel

29. Which of the following is the correct procedure for making a <u>gradual bend</u> in strap iron?

a. Clamp tight in vise and use a section of pipe for leverage
b. Clamp tight in vise against a piece of round stock
c. Slipping the strap iron down between open vise jaws as it is bent
d. Hammer strap iron across the face of the anvil

30. Which of the following would you use to thread round stock?

a. Thread chaser
b. Tap
c. Die
d. Hardy

31. Which of the following is the important <u>first step</u> when soldering?

a. Clean the surface(s)
b. Apply the proper flux
c. Apply a coat of solder
d. Evenly heat surface(s)

<u>Competency</u>:

The student will demonstrate the ability to wire a three-way switch using selected hand tools.

32. How many poles does a three-way switch have?

a. 1
b. 2
c. 3
d. 4

33. A three-way switch system is used to control a light or other fixture from:

a. 1 location
b. 2 locations
c. 3 locations
d. 4 locations

34. A three-way switch system requires:

a. 1 carrier and 2 common wires
b. A double carrier and 1 common wire
c. A double carrier and 2 common wires
d. 1 single carrier and 3 hot common wires

35. A three-way switch has:

a. 3 brass poles
b. 2 silver poles
c. 3 silver poles
d. 1 silver pole

Competency:

The student will demonstrate the ability to mix concrete according to prescribed standards.

36. Concrete components (sand and rock) are usually sold by the:

a. Square foot
b. Square yard
c. Cubic foot
d. Cubic yard

37. What is the volume of a 94 pound bag of portland cement?

a. 1 foot ^{3}
b. 1 1/2 foot ^{3}
c. 1/2 yard ^{3}
d. 1 yard ^{3}

38. How many part(s) of cement is (are) added to a 1:2:4 mixture?

a. 1
b. 2
c. 4
d. 7

39. Which of the following mixtures would require the least amount of water given the condition of the sand?

a. 2:2:3; wet sand
b. 2:2:4; dry sand
c. 2:2:4; damp sand
d. 3:3:5; damp sand

40. What is the desired "workable" mixture of concrete for placement in forms?

a. Stiff
b. Medium
c. Wet
d. Not enough information given

Competency:

The student will cut, thread, and ream a pipe.

41. What is the recommended turn of a wheel cutter handle per revolution of pipe?

a. 1/32
b. 1/4
c. 1/2
d. 3/4

42. Simple Burr Reamers are made to fit:

a. Drill press
b. Pipe threading handle
c. Hacksaw frame
d. Brace
e. Single "T" handle

43. Which of the following is the recommended lubricant for cutting and threading pipe?

a. Lard oil
b. 90 weight motor oil
c. Cutting Oil
d. Linseed oil

44. Which of the following is the correct procedure if the die catches when backing off a threaded pipe?

a. Tap the threader handle with a hammer
b. Turn forward again
c. Place a short section of pipe on threader handle
d. Tap the die on opposite sides with equal pressure

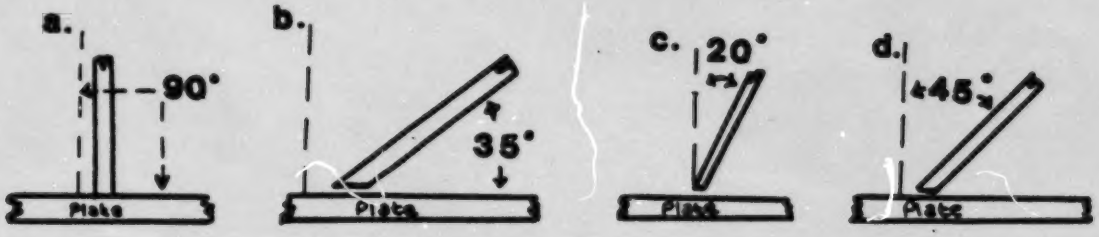
45. Which of the following is a necessary tool for sweating copper tubing?

a. Tap
b. Die
c. Burr Reamer
d. Flaring tool

Competency

The student will demonstrate the proper settings for the electric welder, demonstrate the ability to select the proper welding rod for welding a selected project, and demonstrate the ability to weld in flat, vertical, and overhead positions according to prescribed standards.

Refer to the following diagrams (A, B, C, D) to answer Questions 46-48.



46. Which of the above, diagrams the correct angle of the electrode while running a bead?

47. Which of the above, diagrams the correct angle of the electrode while striking an arc with the tapping method?

48. Which of the above diagrams the correct angle of the electrode while striking an arc with the scratching method?

49. What measurement of the electrode determines its size?

    a. The metal thickness it is gauged for
    b. The diameter of the electrode
    c. 1/4 the length of the unfluxed tip of the electrode in inches
    d. The amperage setting

50. What is the correct amperage range for a 1/8" electrode?

    a. 70 to 120
    b. 120 to 170
    c. 140 to 240
    d. 220 to 270

51. Which of the following is the correct welding position number of an E7014 electrode?

    a. 7
    b. 70
    c. 1
    d. 4

52. Which of the following electrodes would you choose if you needed an all position electrode which would provide a strong weld?

a. E 6045
b. E 6011
c. E 7022
d. E 7014

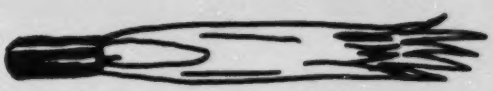
Competency:

The student will demonstrate the proper technique in brazing, cutting, and bending selected metal stock or plate using an oxyacetylene welding system according to prescribed standards.

Refer to the following diagrams (A, B, C) to answer Questions 53 through 57.

a.

b.



c.

53. Which of the above flames would you use for mild steel welding, cutting, and bending?

54. Which of the above illustrates a carburizing flame?

55. Which of the above illustrates a neutral flame?

56. Which of the above illustrates a hard surfacing flame?

57. Which of the above flames would you use during brazing operations?

58. How is flux applied during brazing?

a. Flux is not used when brazing
b. Flux is a sticky paste and will stick to the rod
c. Pour 1/4" line of flux along area to be welded
d. Heat bronze rod and dip into flux

59. Which of the following is the correct indication (when a drop of bronze rod is melted) that the base metal is at the proper temperature for brazing?

a. The drop bubbles up and runs around
b. The drop spreads out
c. The drop fuses into the molten pool
d. The drop rolls off

Competency:

The student will perform inspections on tractors at recommended time intervals.

60. How many hours is considered as daily for tractor maintenance?

a. 6
b. 8
c. 10
d. 12

61. Daily maintenance of tires requires:

a. Pressure gauge readings
b. Visual inspection
c. Application of rubber preservatives
d. Washing out soil from between treads

62. Which of the following is the most important point to remember when lubricating a tractor?

a. Wipe fitting
b. Always use full grease gun
c. Always pump grease gun 5 times
d. It is unnecessary in cold weather

63. Oil bath air cleaner, under normal operating conditions, should be serviced:

a. Weekly
b. Twice weekly
c. Daily
d. Twice daily

64. What is the proper depth range from the radiator filler cap to the engine coolant level?

a. 3 - 4 1/2 inches
b. 2 - 3 inches
c. 1/2 - 2 inches
d. Full to 1/2 inch

Competency:

The student will service ignition and electrical systems on tractors according to the service manuals.

65. Which of the following equipment is NOT used in battery maintenance?

a. Hydrometer
b. Cell condenser
c. Cell analyzer
d. Battery syringe

66. Which of the following timing methods is used while the tractor engine is stopped?

a. Generator timing method
b. Timing light method
c. Breaker point method
d. Alternator timing method

67. Rotating the distributor in the direction that the roter turns will:

a. Unlock the distributor for removal
b. Open the points
c. Set the points
d. Close the points
e. None of the above

68. Which of the following is a manufacturer's mark found on a pulley or flywheel to denote the compression stroke of the #1 piston?

a. 1 PC
b. PC 1
c. DCT
d. TDC

Competency:

The student will trouble shoot selected problems on a tractor.

69. Which of the following conditions would cause oil to be found floating on the coolant in the raditor?

    a. Crank case leak
    b. Time to change antifreeze
    c. Leak in radiator
    d. Both A and C

70. Which of the following situations would cause the temperature light to turn on?

    a. Hign engine speed
    b. Bad thermostat
    c. Low coolant level
    d. Both b and c

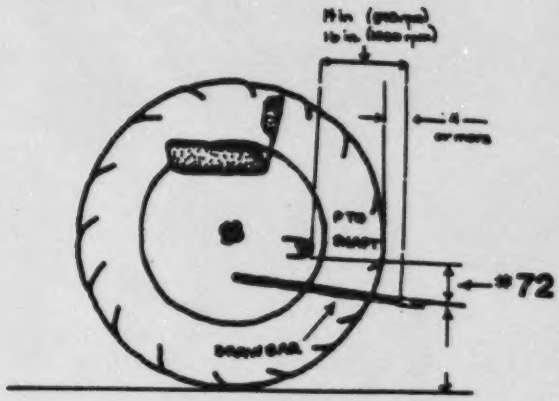
71. Which of the following would you do first, if after turning the ignition switch on, the tractor turned over, but failed to start?

    a. Clean filter
    b. Check fuel tank
    c. Check battery
    d. Check timing

Competency:

The student will demonstrate the ability to attach selected equipment to power units (Tractor PTO).

72. Refer to the diagram below. Which of the following is considered the "best" height of the PTO shaft over the drawbar hitch point, by the ASAE?



a. 5 inches
b. 8 inches
c. 11 inches
d. 17 inches

73. Which of the following links should be attached first during proper 3-point hitch hook-up?

a. Upper link
b. Right link
c. Left link
d. Either A or C

74. Which of the following is used to hold the drawbar at the correct height when this drawbar is mounted as part of the 3-point hitch?

a. Clamp 3-point hitch lift level
b. Swaybars
c. Sway blocks
d. Take slack out of check chains

75. When connecting the PTO shaft to power equipment, phasing is very important. Phasing is making sure:

a. The PTO Universal joints operate in the same plane
b. The PTO Universal joints operate in opposite planes
c. That correct splines are used
d. Telescoping PTO shafts are not over extended

Competency:

The student will assemble and adjust planting equipment according to planting conditions on lab plot.

76. What minor adjustments are needed for multicrop planters when changing from one crop to another?

a. Altering the depth-control crank
b. Changing the closing wheels
c. Changing the seed plate
d. Changing the depth bands

77. Which of the following planters would use a fluted and/or ripple coulter?

a. Bed planter
b. Strip rotary tillage planter
c. Lister planters
d. No-till planter

78. Which of the following are common seed covering devices?

a. Blade and scoop
b. Shovel and knife
c. Disk and chain
d. Both B and C

Competency:

The student will assemble and adjust selected tillage equipment according to tillage conditions on lab plot.

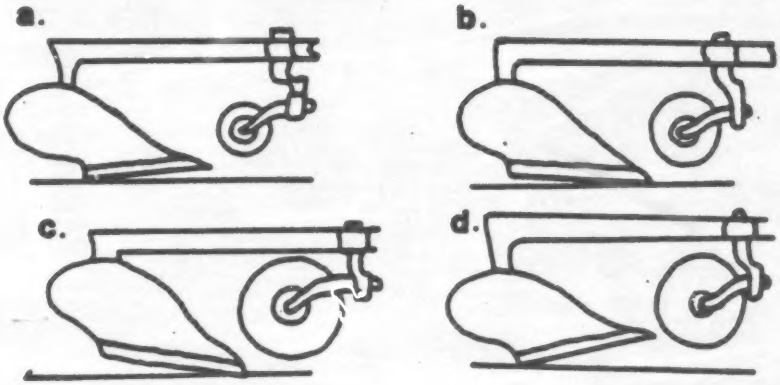
79. Refer to the illustration on the right. Which of the following is the reason for using a rolling coulter?

a. Make penetration easier by cutting surface track
b. Reduces plow drag
c. Aids in trash coverage
d. Reduces side draft of plow

80. Which of the following is the correct adjusted position for a sweep on a row crop cultivator?

a. b. c. d.

Refer to the following illustrations (A, B, C, D) to answer Questions 81 through 82.



81. Which of the above is the correct adjusted position for a moldboard plow (disregard coulter size)?

82. Which of the above would be the correct leading coulter for use in a field with a lot of trash (disregard plow position)?

Competency:

The student will determine maintenance problems and make minor repairs to buildings and equipment.

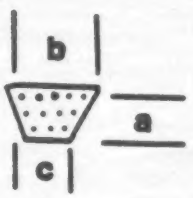
83. Which of the following is a probable cause of oil overheating in the hydraulic system?

a. Pump volume too high
b. Viscosity of oil too high (thick)
c. Lines restricted
d. Oil leakage due to wear
e. All of them

84. Which of the following is <u>NOT</u> a probable cause of the hydraulic system, on a tractor, failing to deliver oil?

a. Oil intake or filter plugged
b. Low oil level in reservoir
c. Relief valve setting too high
d. Air leakage in line

85. Refer to the diagram below. Which of the following identifies the width of a V-belt?



d. WIDTH = b+c

86. Which of the following would be the probable cause of finding hydraulic oil milky?

a. An air leak somewhere in the system
b. Water leaking into system
c. Too heavy of a grade of oil (high viscosity)
d. Too light of a grade of oil (low viscosity)

ANSWER KEY

AGRICULTURAL MECHANICS

1	A
2	B
3	D
4	C
5	B
6	C
7	A
8	C
9	A
10	A
11	A
12	B
13	C
14	C
15	B
16	C
17	D
18	B
19	B
20	A
21	D
22	C
23	C
24	B
25	B
26	C
27	A
28	D
29	C
30	C
31	A
32	C
33	B
34	B
35	A
36	D
37	A
38	A
39	A
40	B
41	B
42	E
43	C
44	B
45	C
46.	D
47.	A
48.	C
49.	B
50.	A
51.	C
52.	D
53.	B
54.	C
55.	B
56.	A
57.	C
58.	D
59.	B
60.	C
61.	B
62.	A
63.	A
64.	C
65.	B
66.	C
67.	E
68.	D
69.	A
70.	D
71.	B
72.	B
73.	C
74.	B
75.	A
76.	C
77.	D
78.	D
79.	A
80.	A
81.	B
82.	C
83.	E
84.	C
85.	B
86.	B